Lake Oscaleta

Surface water quality classification: Class B

Morphology Summary:

Characteristic	Units	Value	Source
Surface area	hectares	26	Cedar Eden 2004
Watershed area*	hectares	384	EcoLogic 2008 (excl lake)
Volume	mgal	412	Cedar Eden 2004
Elevation	m	144	CSLAP 2006
Maximum depth	m	10.8	Cedar Eden 2004
Average Depth	m	5.9	Cedar Eden 2004
*Approximately 73% of the watershed area is within the State of Connecticut; approximately 6% is located in the Town of North Salem.			

Lake Inlet: at the northeast end via channel from Lake Rippowam (Cedar Eden 2002), and via Rippowam Creek on the east shore.

Lake Outlet: at the western end of the lake, discharging via channel to Lake Waccabuc.

Recreational impacts: Water quality and aquatic plants were both cited as impacting recreational assessments, although the most significant impacts were associated with poor clarity and high algae levels. (CSLAP 2006)

Lakeshore Development: Northern shore (Twin Lakes Community built in the 1950's). Southern shore there is a cluster of camps (built in early 1900's) that are now mostly year-round homes. Community beach at the northwest end. Otherwise, the shoreline is forested. Forested wetlands at eastern and western ends of the lake (Cedar Eden 2002).

Figure 1
Lake Oscaleta
Bathymetry

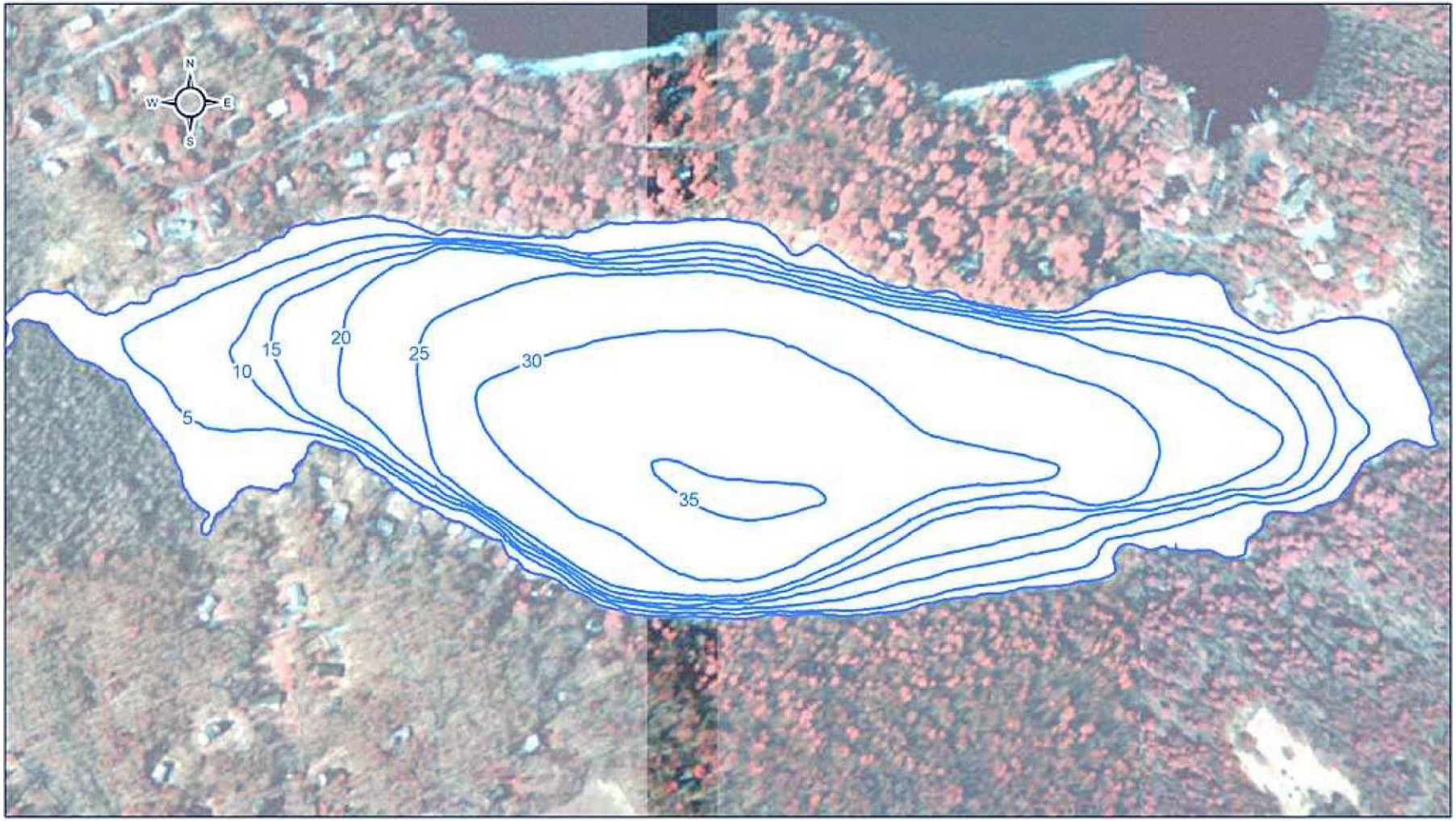
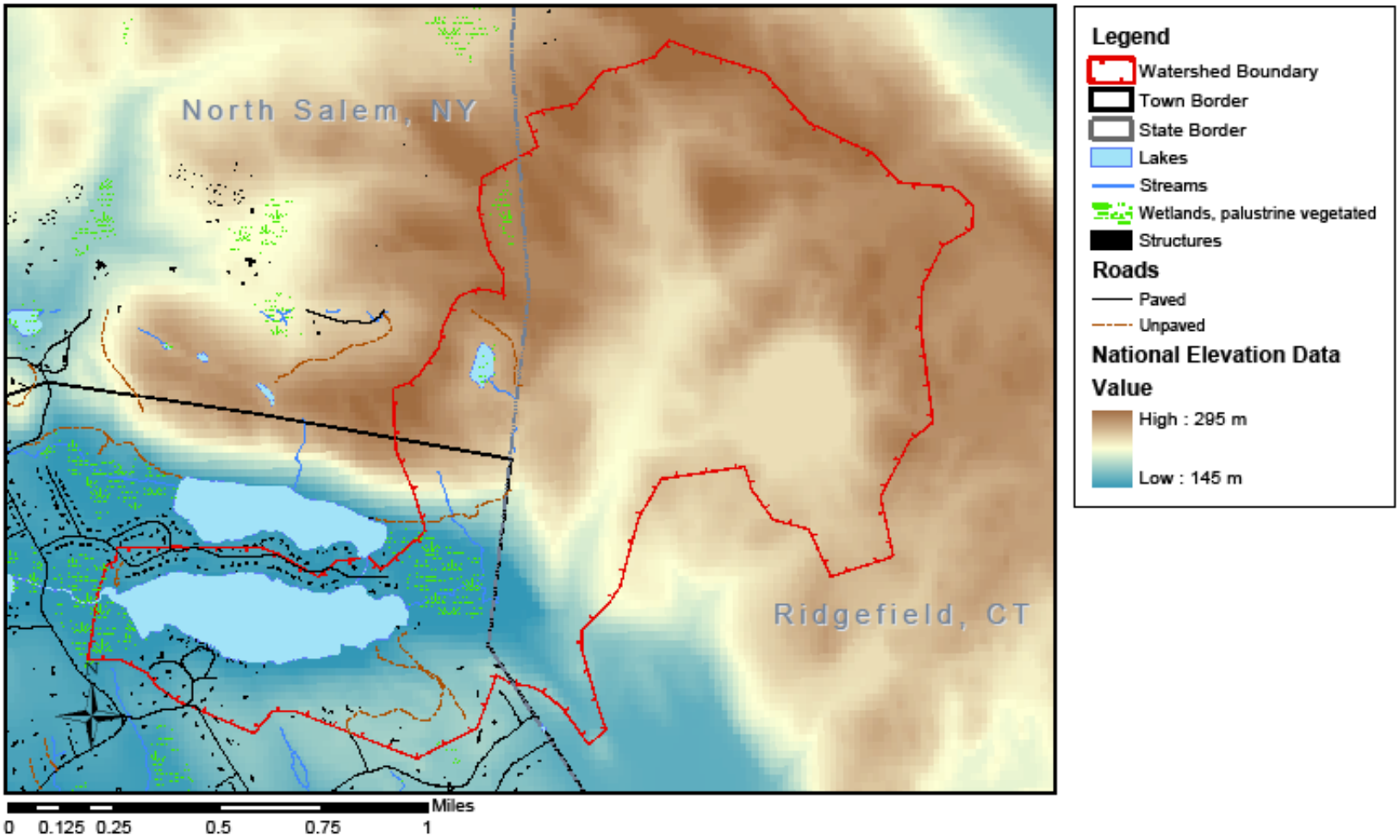


Figure 4.2 Bathymetric map of Lake Oscaleta

Data Source: Field Points by P.Lewis, 5 foot contours by CEE LLC

Figure 2
Lake Oscaleta
Topographic and Human Features



Sources:
Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site http://giswww.westchestergov.com/. Municipal planimetric datasets were photogrammetrically derived from the county's 2004 base map project and meet National Map Accuracy Standards at 1"=100'.
National Elevation Dataset - U.S. Geological Survey (USGS), EROS Data Center, 1999. On-line at http://gisdata.usgs.net/ned/. Geographic coordinate system. Horizontal datum of NAD83. Vertical datum of NAVD88.

Historical water quality data summary: Data have been collected as part of the New York Citizens Statewide Lake Assessment Program (CSLAP), as well as by the Three Lakes Council and other entities over time. Depths ranging from 0 to 11 meters (both upper and lower waters), including some half-meter increment profiles. Table A below summarizes samples collected between January and December of each year; the statistics represent averages of sample results for the time period for all depths, unless otherwise noted. Table B below summarizes samples collected during the summer, defined as the period between June 15 and September 15 each year.

A. Representing samples collected between January and December each year.

Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Alkalinity (mg/l)	1972-1974	52	15	45	29
	2002-2007	8	16	38	31
Calcium (mg/l)	2006-2007	4	11.7	15.6	12.77
Chlorophyll-α (mg/m^3) – Jun-Sept	1979	19	0.81	19.8	6.13
	1980-1982	23	0.75	56	7.13
	2002-2007	41	0.16	53.6	8.90
Color (platinum color units)	2006-2007	16	8	35	16.75
Conductivity	1972-1974	49	94	132	109
	2002-2007	39	108	177	146
Fe++ (mg/l)	1975	10	0.025	0.45	0.15
Mn++ (mg/l)	1975	10	0.01	1.01	0.40
pH (std units)	1972-1974	52	6.3	7.36	6.80
	2002-2007	28	6.85	10.03	7.87
Phaeophytin-α (mg/m^3)	2003-2006	19	0.005	2.1	0.38
Secchi depth (m)	1972-1979	97	1.0	5.3	3.34
	1980-1983	69	1.5	4.25	2.92
	2002-2007	88	0.5	4.42	2.73
Temperature:					
Surface (°C) (depth <2m)	1974-1979	32 (0-1 m)	17	27.5	22.98
	1981-1983	78 (0-1 m)	6.8	28.3	20.4
	1991	2 (0-1.5m)	25	26	25.5
	2002-2007	170 (0-1.5 m)	3.3	31	19.57
Depth >8m (°C)	1978-1979	22 (9-10 m)	8.5	11	9.5
	1981-1982	29 (9 m)	6.5	10.5	8.13
	1991	1 (9.1 m)	8.5	8.5	8.5
	2002-2007	204 (9-11 m)	3.8	10.2	7.06
Dissolved Oxygen:					
Surface (mg/l) (<2 m)	1972-1979	30 (0-1 m)	7.8	10	8.79
	1981-1983	78 (0-1 m)	4.4	12.3	8.22
	1991	2 (0-1.5 m)	7.9	8.0	7.95
	2002-2007	152 (0-1 m)	7.13	16	10.0
Depth >8m (mg/l)	1978-1979	19 (9-10 m)	0	0.5	0.12
	1981-1982	29 (9 m)	0	7.8	1.04
	1991	1 (9.1 m)	1.1	1.1	1.1
	2002-2007	198 (9-11 m)	-0.77	12.28	2.43

A. Representing samples collected between January and December each year.

Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Nutrients					
Phosphorus:					
Surface (mg/l) (<2 m)	2002-2007	43 (1.5 m)	0.012	0.055	0.024
Depth >8m (mg/l)	1975	13 (9 m)	0.015	0.225	0.072
	2004-2007	35 (9-10 m)	0.013	0.240	0.069
Soluble Reactive P (mg/l)	1975	14	0.001	0.131	0.043
Nitrate-N (mg/l)	1973-1975	34	0	0.19	0.052
	2003-2007	21	0.003	0.045	0.011
Total Kjeldahl Nitrogen (mg/l)	1975	14	0.24	1.7	0.99
	2002-2007	13	0.37	1.0	0.62
Ammonia Nitrogen (mg/l)	1973-1975	37	0.04	1.7	0.67
	2006-2007	16	0.006	0.12	0.028

B. Representing samples collected between June 15 and September 15 each year.

Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Chlorophyll-α (mg/m^3)	1979	10	0.81	9.8	3.21
	1980-1982	5	0.75	4.4	2.59
	2002-2007	26	0.16	53.6	8.84
Phaeophytin-α (mg/m^3)	2003-2006	12	0.005	1.2	0.23
Secchi depth (m)	1972-1979	43	1	5	3.37
	1980-1983	37	1.8	4.2	3.17
	2002-2007	33	0.5	4.42	3.15
Dissolved Oxygen:					
Surface (mg/l) (< 2m)	1972-1979	24 (0-1 m)	7.8	10	8.69
	1981-1983	46 (0-1 m)	4.4	10.2	7.6
	1991	2 (0-1.5 m)	7.9	8	7.95
	2002-2007	50 (0-1 m)	7.59	14.3	9.04
Depth >8 m (mg/l)	1978-1979	16 (9-10 m)	0	0.3	0.088
	1981-1982	15 (9 m)	0	1.4	0.49
	1991	1 (9.1 m)	1.1	1.1	1.1
	2002-2007	64 (9-10.5 m)	-0.01	1.03	0.33
Nutrients					
Phosphorus:					
Surface (mg/l) (<2 m)	2002-2007	26 (1.5 m)	0.012	0.055	0.024
Depth >8 m (mg/l)	1975	4 (9 m)	0.053	0.225	0.129
	2004-2007	21 (9-10 m)	0.013	0.133	0.065
Soluble Reactive P (mg/l)	1975	5	0.001	0.131	0.073
Nitrate-N (mg/l)	1973-1975	14	0.0005	0.108	0.06
	2003-2007	14	0.0025	0.02	0.009

B. Representing samples collected between June 15 and September 15 each year.

Parameter (units)	Time Period	Number of Samples	Minimum	Maximum	Average
Total Kjeldahl Nitrogen	1975	5	0.656	1.7	1.30
(mg/l)	2002-2007	9	0.374	1	0.640
Ammonia Nitrogen	1973-1975	14	0.53	1.55	0.96
(mg/l)	2006-2007	11	0.006	0.12	0.028

Sediment data summary: Composite samples collected May 29, 2008 (EcoLogic, 2008):

Parameter	Analytical Method	Result (mg/kg dry wt)
Pesticides/PCBs	EPA 8081/8082	ND
TCL Volatiles	EPA 8260B	ND
TCL PAHs	EPA 8270	ND
RCRA Total Metals	EPA 6010	
Arsenic		ND
Barium		ND
Cadmium		ND
Chromium		ND
Copper		1.1
Lead		2.0
Selenium		ND
Silver		ND
RCRA Mercury	EPA 7471	ND
Total Organic Carbon	EPA 9060	110,000
Total Solids	SM 18-20 2540B	6.1%

ND – non-detect. Analytes reported as less than the method detection limit.

Sediment Contaminant Analysis: Interest has been expressed in exploring the feasibility of dredging. A composite sediment sample was collected on May 29, 2008 (EcoLogic, 2008). Results are summarized in Table C, in the context of NYSDEC Screening levels. A complete set of results is appended. The NYSDEC screening levels are separated into three Classes: A, B, and C:

- **Class A - No Appreciable Contamination (No Toxicity to aquatic life).**
  If sediment chemistry is found to be at or below the chemical concentrations which define this class, dredging and in-water or riparian placement, at approved locations, can generally proceed.

- **Class B - Moderate Contamination (Chronic Toxicity to aquatic life).**
  Dredging and riparian placement may be conducted with several restrictions. These restrictions may be applied based upon site-specific concerns and knowledge coupled with sediment evaluation.

- **Class C - High Contamination (Acute Toxicity to aquatic life).**
  Class C dredged material is expected to be acutely toxic to aquatic biota and therefore, dredging and disposal requirements may be stringent. When the contaminant levels exceed Class C, it is the responsibility of the applicant to ensure that the dredged material is not a regulated hazardous material as defined in 6NYCRR Part 371. This TOGS does not apply to dredged materials determined to be hazardous.

Table C. Lake Oscaleta sediment analytical results with NYSDEC Sediment Quality Threshold Values for Dredging, Riparian or In-water Placement. Threshold values are based on known and presumed impacts on aquatic organisms/ecosystem. Results that fall into Class C (high contamination) are highlighted.

Compound	Required Method Detection Limit	Threshold Values			Oscaleta Results	Threshold Class
		Class A	Class B	Class C		
Metals (mg/kg dry wt) – EPA Method 6010B						
Arsenic	1.0	< 14	14 – 53	> 53	ND	A
Cadmium	0.5	< 1.2	1.2 - 9.5	> 9.5	ND	A
Copper*	2.5	< 33	33 – 207	> 207	1.1	A
Lead	5.0	< 33	33 – 166	> 166	2.0	A
Mercury[+]	0.2	< 0.17	0.17 - 1.6	> 1.6	ND	A
PAHs and Petroleum-Related Compounds (mg/kg dry wt) – EPA Methods 8020, 8021, 8260 and 8270						
Benzene	0.002	< 0.59	0.59 - 2.16	> 2.16	ND	A
Total BTEX*	0.002	< 0.96	0.96 - 5.9	> 5.9	ND	A
Total PAH[1]	0.33	< 4	4 - 35	> 35	ND	A
Pesticides (mg/kg dry wt) – EPA Methods 8081						
Sum of DDT+DDD+DDE[+]	0.029	< 0.003	0.003 - 0.03	> 0.03	ND	A
Mirex*[+]	0.189	< 0.0014	0.0014 - 0.014	> 0.014	na	--
Chlordane*[+]	0.031	< 0.003	0.003 - 0.036	> 0.036	ND	A
Dieldrin	0.019	< 0.11	0.11 -0. 48	> 0.48	ND	A
Chlorinated Hydrocarbons (mg/kg dry wt) – EPA Methods 8082 and 1613B						
PCBs (sum of aroclors)[2]	0.025	< 0.1	0.1 - 1	> 1	ND	A
2,3,7,8-TCDD*[3](sum of toxic equivalency)	0.000002	< 0.0000045	0.0000045 - 0.00005	> 0.00005	na	--

na – not analyzed; ND – not detected

[+]Threshold values lower than the Method Detection Limit are superseded by the Method Detection Limit.

* Indicates case-specific parameter. The analysis and evaluation of these case specific analytes is recommended for those waters known or suspected to have sediment contamination caused by those chemicals. These determinations are made at the discretion of Division staff.

[1]For Sum of PAH, see Appendix E of TOGS 5.1.9. For Lake Oscaleta, each of the 16 PAH compounds were reported as non-detect (<0.5 mg/kg).

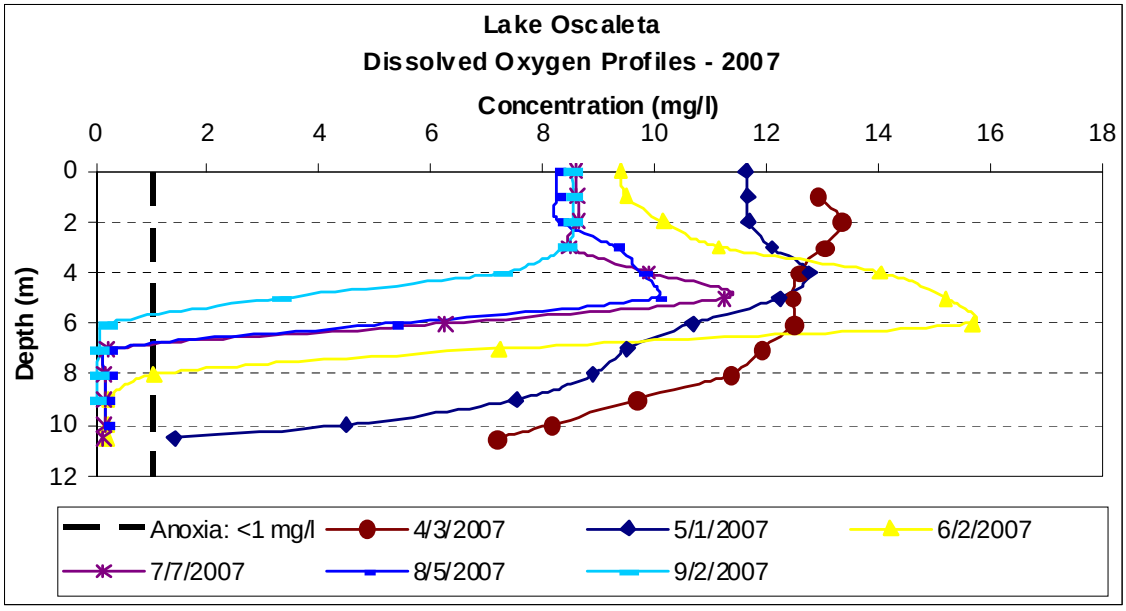
[2]For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration. On Lake Oscaleta, seven Aroclors were each reported as <0.2 mg/kg; this value is reported above.

[3]TEQ calculation as per the NATO - 1988 method (see Appendix D of TOGS 5.1.9).

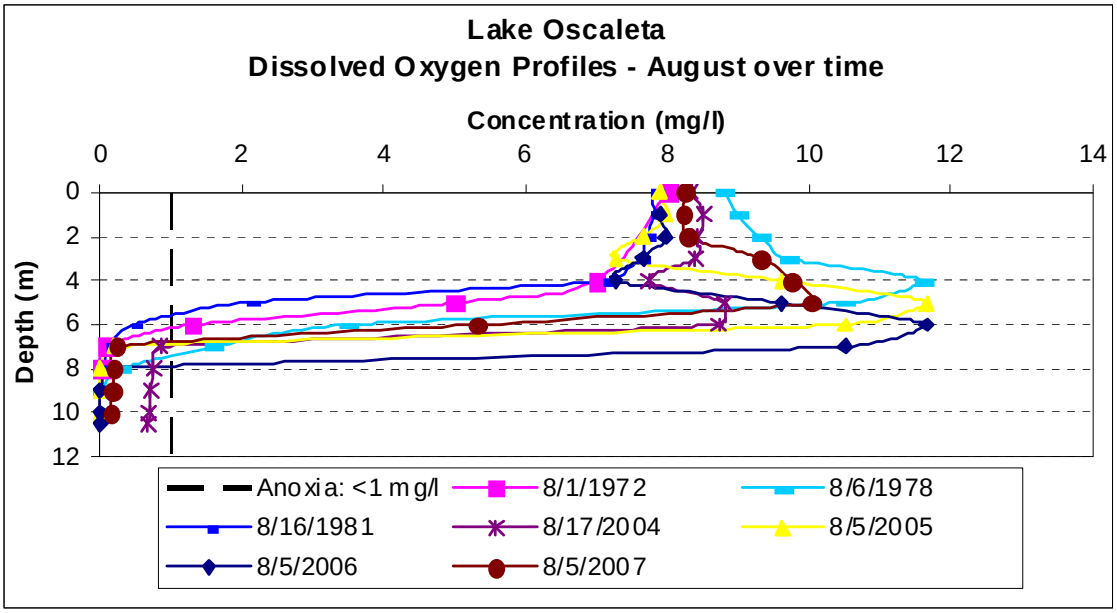
Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

Source: Table 2, NYSDEC Division of Water, Technical & Operational Guidance Series (TOGS) 5.1.9, "In-Water and Riparian Management of Sediment and Dredged Material", Nov 2004.

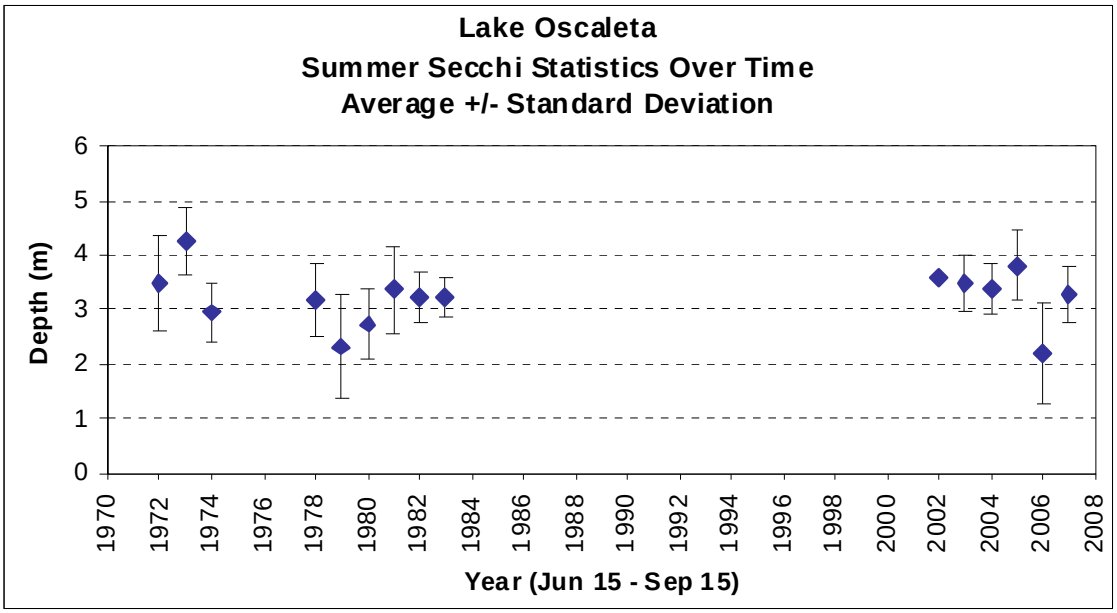
Anoxia: During 2007, the lake shows evidence of stratification as dissolved oxygen concentrations in lower waters become anoxic by June, and remain anoxic into September.



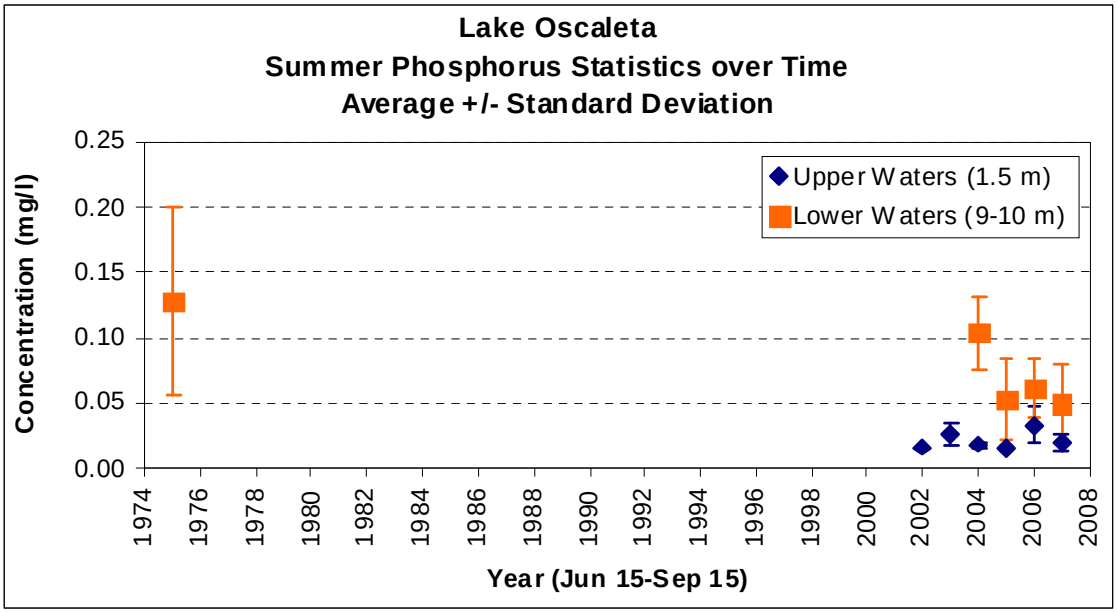
Dissolved oxygen decreases in lower waters, resulting in anoxic conditions in August at depths greater than 6 meters. These conditions were evident from the 1970's to the present.



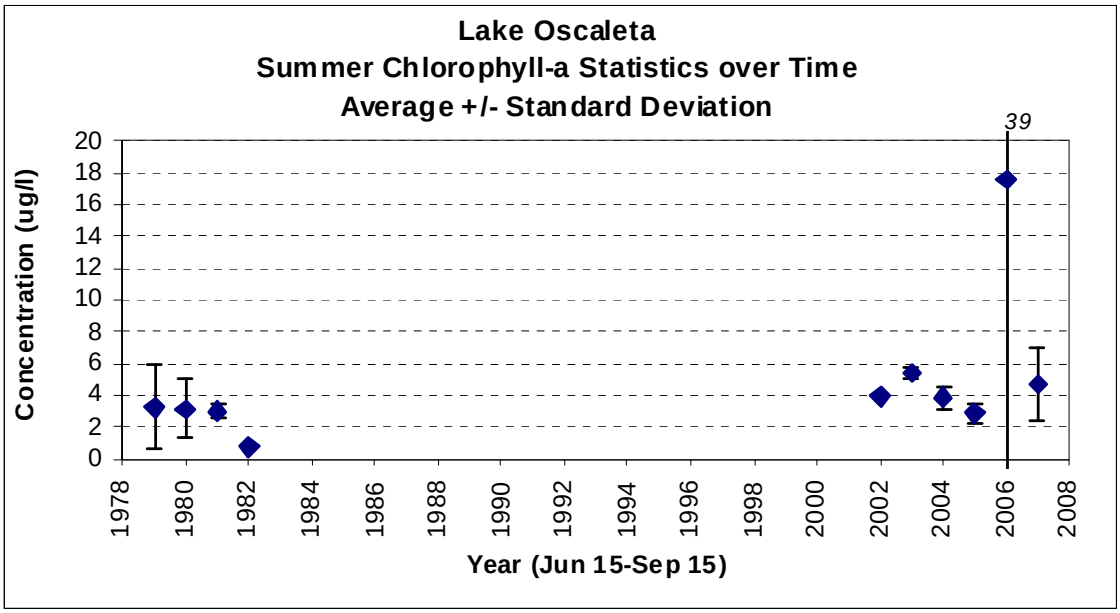
Water Clarity: Summer (June 15 to September 15) Secchi transparency averages over time are generally more than 3 meters, and historical variability around the mean is similar to recent years.



Phosphorus Concentrations: Phosphorus concentrations in upper waters have been fairly stable since 2002. During the summer months when anoxia occurs in the lower waters, phosphorus concentrations are higher in lower water samples than in upper water samples.



Chlorophyll-α: Chlorophyll-α concentrations are, on average, slightly higher in recent years compared with the late 1970's and early 1980's. The standard deviations show low variability of the data except for 2006.



Trophic Status:

Parameter	Trophic State (shading indicates match to Lake)				Lake Oscaleta*
	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic	
Summer average Total Phosphorus, upper waters (µg/l)	<10	10-35	35 -100	>100	24
Summer chlorophyll-a, upper waters (µg/l)	<2.5	2.5 - 8	8 - 25	>25	8.8
Peak chlorophyll-a (µg/l)	<8	8-25	25-75	>75	54
Average Secchi disk transparency, m	>6	6-3	3-1.5	<1.5	3.15
Minimum Secchi disk transparency, meters	>3	3-1.5	1.5-0.7	<0.7	0.5
Dissolved oxygen in lower waters (% saturation)	80 - 100	10-80	Less than 10	Zero	2.79

*Phosphorus, chlorophyll and Secchi data for the period 2002-2007. Summer June 15 to September 15. Dissolved oxygen percent saturation calculated using data from June 15 to September 15 at depths greater than 10 m.

Aquatic Habitat:

- Phytoplankton in 2003 included Golden, Green and Bluegreen groups. June through July the Bluegreen groups dominated (#cells/ml ranged from 15,270-21,452); in August and September the Green and Golden groups were dominant (#cells/ml ranged from 10,225 to 3,298). (Cedar Eden 2004)

- Zooplankton in 2003 were dominated by Rotifers in June, accounting for 90% of the zooplankton community. In July, Cladocerans (*Bosmina/Ceriodaphnia*) dominated (50%). The Rotifers returned in September (52%) with Cladocerans and Copepods making up the rest of the population (24% and 25%, respectively. (Cedar Eden 2004)

- Aquatic Plants in July 2003 were present in large beds at the east and west ends, in a narrow band along the northern shore, and in some parts of the southern shore. Residents of the area have noted that bassweed may actually be out-competing the Eurasian water milfoil at the west end of the lake. (Cedar Eden 2004).

List of Aquatic Plants identified in 2003:

Scientific Name	Common Name
Brasena schreberi	Watershield
Ceratophyllum spp.	Coontail
Decodon spp.	Three-way sedge
Eleochaaris quadrangulata	Four-edge sedge
Eleocharis spp.	Spike-rush
Elodea canadensis	Canadian waterweed
Iris spp.	Iris
Lythrum salicaria	Purple loosestrife

Scientific Name	Common Name
Myriophyllum spicatum	Eurasian watermilfoil
Nuphar spp.	Yellow water lily
Nympheae spp.	White water lily
Pontederia cordata	Pickerelweed
Potamogeton amplifolius	Bassweed
Potamogeton robensii	Robin's Pondweed
Sagittaria spp	Arrowhead
Scirpus spp.	Bulrush

Invasive Species: Early Detection List for eight regions in New York State, published by the Invasive Species Plant Council of New York State. Obtained on-line (11/29/07). Lower Hudson region list:

Scientific Name	Common Name
Heracleum mantegazzianum	Giant Hogweed
Wisteria floribunda	Japanese Wisteria, Wisteria
Digitalis grandiflora (D. pupurea)	Yellow Foxglove, Foxglove
Geranium thunbergii	Thunberg's Geranium
Miscanthus sinensis	Chinese Silver Grass, Eulalia
Myriophyllum aquaticum	Parrot-feather, Waterfeather, Brazilian Watermilfoil.
Pinus thunbergiana (P. thunbergii)	Japanese Black Pine
Prunus padus	European Bird Cherry
Veronica beccabunga	European Speedwell

Endangered Species:

- US Fish and Wildlife Service

Scientific Name	Common Name	Federal Status
Reptiles		
Clemmys muhlenbergii	Bog Turtle	Threatened, Westchester Co.
Birds		
Haliaeefus leucocephalus	Bald Eagle	Threatened, entire state
Mammals		
Myotis sodalist	Indiana Bat	Endangered, entire state
Felix concolor couguar	Eastern Cougar	Endangered, entire state (probably extinct)
Plants		
Isotria medeoloides	Small Whorled Pogonia	Threatened, entire state
Platanthera leucophea	Eastern Prairie Orchid	Threatened, not relocated in NY
Scirpus ancistrochaetus	Northeastern Bulrush	Endangered, not relocated in NY

- New York Natural Heritage Program – Town of Lewisboro.

Scientific Name	Common Name	NY Legal Status
Reptiles		
Glyptemys muhlenbergii (formerly Clemmys muhlenbergii)	Bog Turtle	Endangered
Birds		
Oporornis formosus	Kentucky Warbler	Protected
Butterflies and Skippers		
Satyrium favonius ontario	Northern Oak Hairstreak	Unlisted
Dragonflies and Damselflies		
Enallagma laterale	New England Bluet	Unlisted*
Plants		
Asclepias purpurascens	Purple Milkweed	Unlisted
Eleocharis quadrangulata	Angled Spikerush	Endangered*

* indicates particular concern for this lake and watershed.

Water Balance:

USGS Mean Annual (inches/year)		Volume (acre-ft/year)
Precipitation (P)	48	265
Evaporation (ET)	22	122
Runoff (R)	26	2,058

Water Budget:	
Inflow to Lake [R+(P-ET)]	908 mgal/year
Lake Volume	412 mgal
Flushing Rate	2.2 times/year
Residence Time	0.45 year

Phosphorus Budget:

(A) Watershed Land Cover: 2001 National Land Cover Data Set (MRLC). Includes phosphorus export coefficient (kg/ha/year) and estimated phosphorus export.

Description	Watershed* (acres)	Cover (%)	Phosphorus Export Coeff	Estim P Export kg/year	Estim P Export Percent
Open water (all)	97	9.0	0.30	12	22
Developed, open space	56	5.2	0.20	4.5	8.5
Developed, low intensity	1.8	0.17	0.30	0.22	0.41
Deciduous forest	683	63	0.07	19	37
Evergreen forest	147	14	0.20	12	22
Mixed forest	13	1.2	0.09	0.48	0.91
Shrub/scrub	1.3	0.12	0.28	0.15	0.29
Pasture/hay	21	1.9	0.30	2.5	4.7
Woody wetlands	54	5.1	0.09	2.0	3.7
Emergent herbaceous wetlands	2.9	0.27	0.10	0.12	0.22
Total Acres	**1078**	**100**		**53**	**100**

*Includes land area in Connecticut and North Salem.

(B) Septic: Septic systems serve the communities along the shoreline (Cedar Eden 2002).

Estimated population on septic by soil suitability class with US 2000 Census household size for 100-meter buffer of surface water.

Class	N Structures*	Average Household	Estimated Population
Not limited	12	2.5	30
Somewhat limited	47	2.5	118
Very limited	9	2.5	23
Total	**68**		**171**

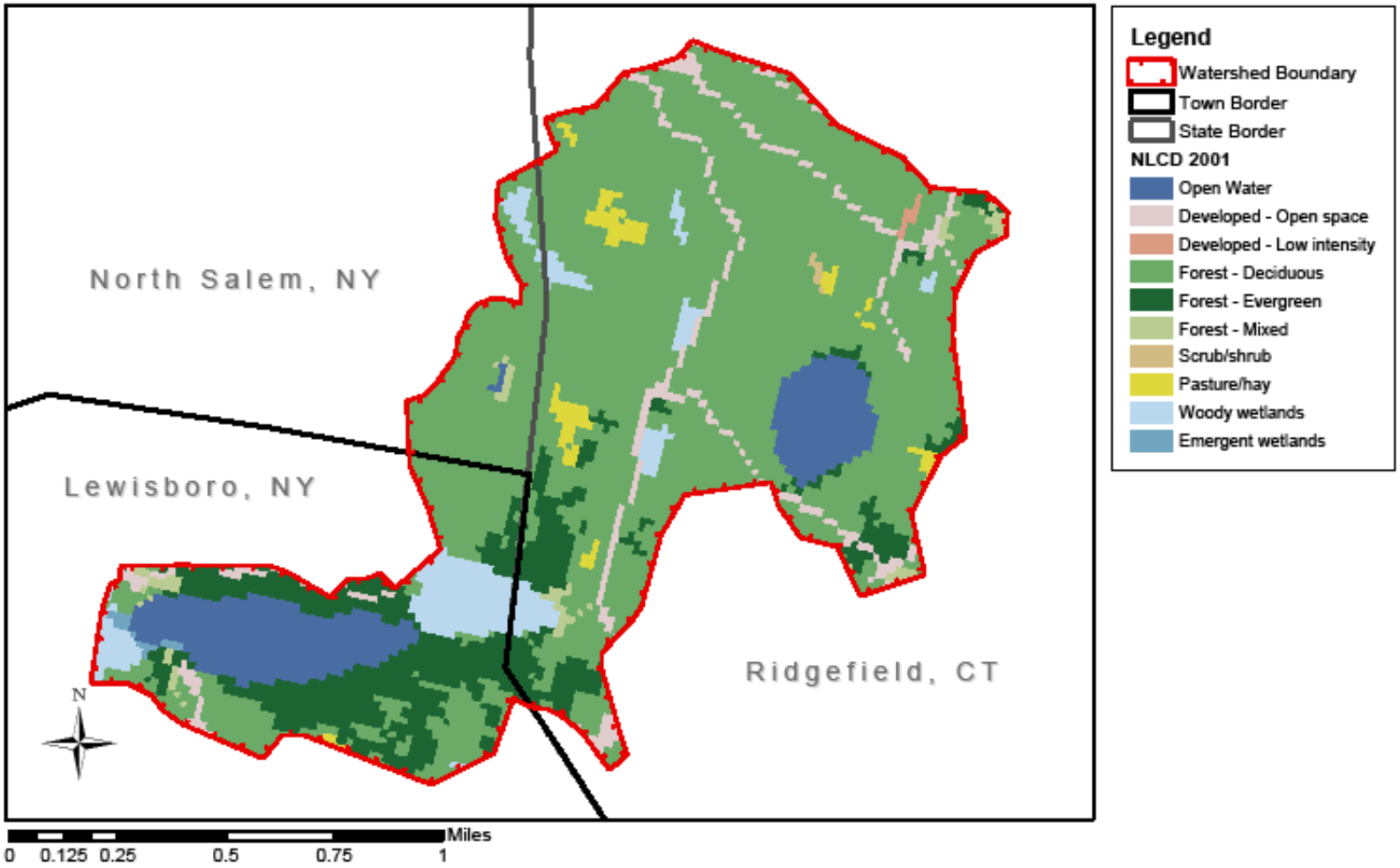
*Structures data not available for Connecticut portion of watershed.

Estimated Phosphorus export by Soil Suitability class for 100-meter buffer of surface water, with failure rate of 5%. (Excludes Connecticut).

Class	Population	P per cap	Transport	kg/year
Not limited	29	0.6	10%	1.7
Somewhat limited	112	0.6	30%	20
Very limited	21	0.6	60%	7.7
Failed systems (5%)	9	0.6	100%	5.1
Total	**171**			**35**

Figure 3

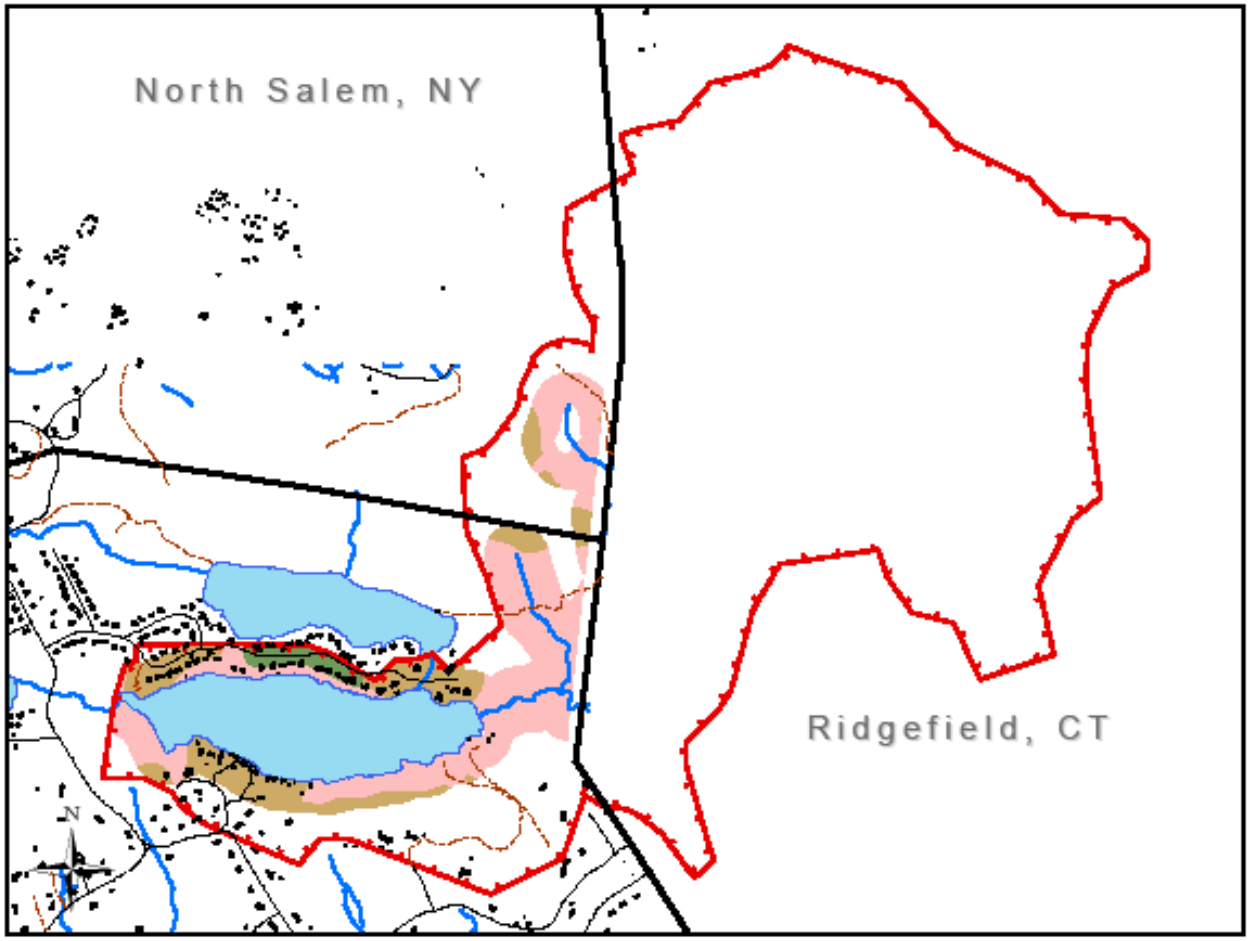
Lake Oscaleta
National Land Cover Dataset 2001



Source:
National Land Cover Database zone 65 Land Cover Layer. On-line at http://www.mrlc.gov
The National Land Cover Database 2001 land cover layer for mapping zone 65 was produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. Minimum mapping unit = 1 acre. Geo-referenced to Albers Conical Equal Area, with a spheroid of GRS 1980, and Datum of NAD83.

Figure 4

Lake Oscaleta
Soil Septic Suitability, 100-Meter Stream Buffer Within the Watershed



Legend

- Watershed Boundary
- Town/State Border
- Lakes
- Streams
- Structures

Roads

- Paved
- Unpaved

Septic Suitability

- Not limited
- Somewhat limited
- Very limited

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect septic absorption fields:

"Not limited" - the soil has features that are very favorable. Good performance and very low maintenance can be expected.

"Somewhat limited" - the soil has features that are moderately favorable. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.

"Very limited" - the soil has one or more features that are unfavorable. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Sources:

Lakes, Streams, Wetlands, Roads and Structures - On-line at Westchester County web site http://giswww.westchestergov.com/. Municipal planimetric datasets were photogrammetrically derived from the county's 2004 base map project and meet National Map Accuracy Standards at 1"=100'.

Soil Survey of Westchester County - Compiled by Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. On-line at http://soildatamart.nrcs.usda.gov/. Accessed November 28, 2007. *"Septic tank absorption fields" are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches or between a depth of 24 inches and a restrictive layer is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health.*

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(C) Point Sources: The outlet of Lake Rippowam flows to Lake Oscaleta.

Estimated point source load of Phosphorus

Source	Estim. Volume input (m^3/year)	Surface Average P 2002-2007 (ug/l)	Estimated P load (kg/year)
Lake Rippowam	721,943	24	17

(D) Summary of Phosphorus Input to the Lake:

Source	Input (kg/year)
Watershed Land Cover	53
Point Sources	17
Septic within 100m of surface water	35
Internal load (sediment)	12
Total	**117**

Phosphorus Mass Balance: Empirical estimates of net loss from system based on mean depth and water residence time.

$$p = W'/10+H\rho$$

where:

p = summer average in-lake TP concentration, ug/l
W′ = areal loading rate, g/m^2/year
H = mean depth, m
ρ = flushes per year

Parameter	Units	Result
W′	g/m^2/year	437
H	m	5.9
ρ	flushes per year	0.45
p	**ug/l**	**34**
Summer(Jun 15-Sep 15) average TP 2002-2007, upper waters:		**24**

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